Influence of Time of Preparation on Rooting and Survival of Hazelnut Hardwood Stem Cuttings

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Abstract

Currently hazelnuts in the Midwest are seed propagated, which means that there is too much variability to manage them as an economic cap. The biggest current obstacle to development of a hazelnut industry in the Upper Midwest is lack of consistently high quality germplasm due to lack of economically viable clonal propagation methods. Propagation of stem cuttings of selected superior germplasm is a potential low-cost method, which can be used to produce large numbers of consistently high yielding plants. The objective of our research is to improve the method, building on previous research results.

Before this experiment hazelnut stem cuttings were collected after dormancy in Nov. and cold stratified until Jan. before being prepared for rooting in humidity tents. This experiment tested whether it would be possible to root them earlier with objective of producing rooted cuttings, which would be ready to transplant to the field in the spring. Cuttings collected in Sep. and Oct. fail to survive and root in the system. Cuttings collected in Nov. rooted equally well whether they were prepared for rooting in Nov. Dec. or Jan. This demonstrated that more than 3 weeks of cold stratification is not necessary.

Photo 1&2: White plastic was pulled over the frame work of the 3 bent PVC pipes to make a tent to maintain high levels of humidity to prevent moisture loss from the rootless stems. These stems were dormant when they were started but they broke dormancy quickly.

Bibliography

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Introduction

Past research has shown that dormant hardwood stem cuttings collected after leaf drop in Nov., can be propagated in Jan. after about 2 months of cold stratification. We wanted to know whether it would be possible to propagate them earlier with little or no stratification. The earlier in the season that cuttings can be started, the earlier they will be ready to be transplanted to the field. If they can be transplanted in the spring, instead of being held in pots through the hot stressful summer for fall transplanting, it would save considerable expense, and would probably also result in higher survival of transplants. So in this experiment, we compared starting cuttings in Sep. Oct. Nov. and Dec. with the previous starting time in Jan.

Cuttings collected in Sep. and Oct. are qualitatively different from cuttings collected later because their bark is not completely hardened up at this time and they still have their leaves on them, leaves that are transpiring moisture. Thus, because they have no roots, they must be kept under conditions of high humidity to reduce moisture loss. However, the fall season is a time when woody plants in nature are translocating nutrients out of their leaves into their root systems for winter storage. These nutrients are often used to grow roots. So stems collected in September and October may grow roots more readily because that is what they would be doing in nature during those months.

Methods

We collected cuttings that still had leaves on them on Sep 24 and Oct 18 and cutting without leaves on Nov 3. The cuttings collected in Sep. and Oct. were prepared for rooting right away where as the cutting collected in Nov. were divided into 3 groups to start on Nov. 26 Dec. 19 and Jan. 22. Jan was the control since Jan. had already been demonstrated as a good starting time.

We dipped the bases of the stems into 2000 ppm Indole-3-Butyric Acid (IBA), a rooting hormone, before inserting them into a mixture of peat and perlite in the humidity tents shown in photos 1 & 2.

Three months after each tent was set up, we pulled the cuttings up and evaluated them for rooting (Photos 3 & 4). Rooted stems were transplanted into pots and grown out in the greenhouse. Un-rooted stems were returned to the humidity tents and evaluated again once a month through June. Survival of potted cuttings was evaluated on Sep 15.

Results

Rooting of stems

- Stems started in Sep. and Oct. rooted significantly less well than the stems started in Nov., Dec. and Jan. ($p<0.002$) (Fig. 1).
- There were no differences in temperature observed between the hot-houses for the different months.
- Stems that were prepared early in the winter took longer to root than the stems prepared later ($p<0.02$); stems prepared in Jan. rooted significantly faster than the stems prepared in Nov. ($p<0.02$) (Fig. 2)

Survival of rooted stems.

- No differences in survival were found between stems started in Nov., Dec. or Jan.
- The most significant predictors of survival were genotype and root quality at potting time.
  - Survival of rooted stems of Rose 9-2 was significantly higher than survival of rooted stems of the other genotypes. ($p<0.05$)
  - The higher the root quality at potting, the higher the survival ($p<0.004$)
  - The healthier the leaves at potting, the higher the survival ($p<0.03$)
- No significant differences were found due to segment type (basal versus medial versus terminal segments).
- Survival was higher with the stems that rooted later in the season ($p<0.03$)

Photo 3: Stems with new healthy leaves growth rating of 5.

Photo 4: Stems with high quality roots but poor quality leaves. These roots were given ratings of, from left to right, 10, 8, 7, and 5

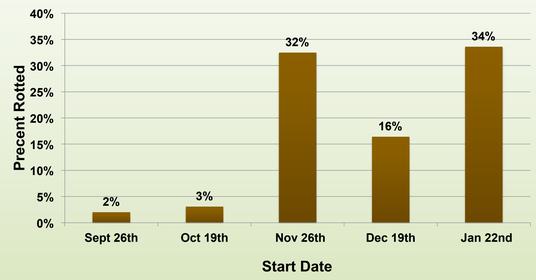

Figure 1: Percent of Stems Rooted at the end of the experiment

Discussion

- Stems started in Dec. rooted significantly less well than the stems started in Nov. and Jan. ($p<0.04$). However, we believe that this may have been due to the location of the Dec. hothouse within the greenhouse (Figs. 1). —We can not be sure because we only had one hothouse per month, which meant that there was no true replication. If we had had more space and stems, we would have had three replicates and would have known for sure whether there really was a problem with starting in Dec.
- Stems prepared in Jan. rooted significantly faster than the stems prepared in Nov., which was probably because in Jan. the stems had fulfilled their chilling requirements and were ready to break dormancy after winter dormancy.
- Survival was higher with the stems that rooted later in the season, which is contrary to expectation because it was hot later in the season.

Conclusions

It is possible to root dormant cuttings collected in Nov. right away, with little or no stratification, but not possible to root cuttings collected before they go dormant in the fall. Cuttings rooted in Nov. in spite of only 3 weeks of stratification.

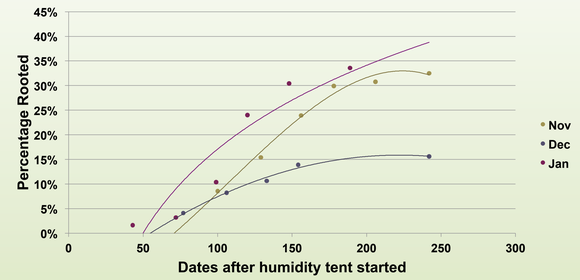

Figure 2: Cumulative Percent Rooting Over Time by Start Date for Nov. Dec. and Jan.

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